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Short-term level rises during the Lake Lisan desiccation - possible correlations to volcanic eruptions

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Short-term decrease in global temperature in response to volcanic eruptions is known from modern events. The eruption of Mount Pinatubo (June, 1991) led to air temperature anomaly throughout the Middle East and resulted in an ecological response and coral death in the Red Sea (Genin et al., 1992). The following winter was characterized by above-average precipitation in the Dead Sea drainage area, which resulted in changes in the lake water column structure and anomalous biological productivity. A 2-m level rise interrupted the dramatic partly-anthropogenic Dead Sea level-drop. These unusual limnological conditions were also associated with the development of a massive levelled terrace on the lake shores.

The modern shore terraces and similar geomorphic features left during the desiccation of Lake Lisan on the margins of the Dead Sea Basin were analyzed using airborne laser scanning (LiDAR), which provides three-dimension geometry with high level accuracy, high resolution, large extent, and coverage of inaccessible areas, all leading to unprecedented level of surface detail. Preliminary results identified about 13 shore terraces on the basin's escarpment along Mineral Beach. These terraces were developed during the transition from the Last Glacial Maximum Lake Lisan high-stands to the Holocene low-stands between 14,700 years BP and 13,800 BP based on the Lake Lisan level curve (Bartov et al., 2003).

We suggest using the modern analogue of Dead Sea level rise during the winter of 1991-92 as an indicator for climatic respond to major volcanic eruptions, like the Pinatubo, in the past. The steep topography and fast Lake Lisan retreat favoured the preservation of the terraces that record the short-term, perhaps even annual, level rise events. The range of terrace height is 1 - 6.5 m and using the Dead Sea Basin hypsometric curve the corresponding volumes of freshwater inputs required for the level rises are $\sim$ 1.9 - 13.7 $\times$ 10^9 m^3.

Evidence for major paleo-eruptions is embedded in the GISP2 ice core record as atmospheric SO_4 concentration peaks (>75 ppb). Using the Greenland ice record, the number of events and their magnitude is correlated with high consistency (R^2=0.8) to the Lake Lisan desiccation terrace record. Hence, Lake Lisan shore terraces record provides useful linkage to global scale teleconnection atmospheric information. We further plan to use atmospheric simulations to quantify the short-term climatic effect of volcanic eruptions on a regional scale.